

## CLAIMS

It is claimed:

Sub A-7 1. A duplex transport system for use with a client computer system and a server computer system, the client computer system and the server computer system communicatively linked to a network system, the duplex transport system comprising:

a browser program configured to run on the client computer system, the browser program having built-in features associated with communication protocols used by the duplex transport system;

one or more browser applications configured to run on the client computer system under control of the browser program;

one or more server applications configured to run on the server computer system;

a client component configured to run as one or more instances on the client computer system, each instance of the client component being communicatively linked to one of the browser applications;

a server component configured to run as one or more instances on the server computer system, each instance of the server component being communicatively linked to one of the server applications; and

the client component and the server component configured such that each of the one or more instances of the client component is associated with one of the one or more instances of the server component to form a session for each association, each session having a session identifier and one or more sub-sessions designated as one or more data pipes, each data pipe being a sub-session of a particular session, having a pipe identifier, and configured to provide two independent data paths of duplex data traffic between the browser application communicatively linked to the instance of the client component associated with the particular session and the server application communicatively linked to the instance of the server component associated with the particular session.

Sub A 7

2. The duplex transport system of claim 1 wherein some of the built-in features of the browser program are associated with either Hypertext Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS), Internet Protocol Secure (IPSEC), Secure Sockets Layer/Transport Layer Security (SSL/TLS), other request-response protocols, and/or the same and/or other protocols approved by communication standards organizations including but not limited to such standards organizations as the International Telecommunications Union (ITU) including such committees as the Telecommunications, and the Telecommunications Standards Sector committee, and the Internet Architecture Board including such task forces as the Internet Engineering Task Force and the Internet Research Task Force.

3. The duplex transport system of claim 1 wherein the client component and the server component is further configured such that the one or more data pipes of a session based on an association between an instance of the client component and an instance of the server component are configured to provide data paths of duplex data traffic comprising messages, each message containing one of the pipe identifiers.

4. The duplex transport system of claim 1 wherein the client component and the server component is further configured such that the one or more data pipes of a session based on an association between an instance of the client component and an instance of the server component are configured to provide data paths of duplex data traffic comprising messages that each contain one of the pipe identifiers identifying the data pipe and a pipe sequence number, the pipe sequence number identifying an order of the messages in the duplex data traffic associated with the data pipe.

5. The duplex transport system of claim 1 wherein the client component and the server component is further configured such that the one or more data pipes of a session based on an association between an instance of the client component and an instance of the server component are assigned the pipe identifier corresponding to the data pipe used by that message.

Sub A 7

6. The duplex transport system of claim 1 wherein the client component and the server component is further configured such that the one or more data pipes of a session based on an association between an instance of the client component and an instance of the server component utilize the communication protocols associated with the built-in features of the browser program for the duplex data traffic.

7. The duplex transport system of claim 1 wherein the built-in features of the browser program involve one or more of the following: uniform resource locators (URLs), firewall/proxy navigation under Hypertext Transfer Protocol (HTTP), proxy configuration of the browser program, HTTP authentication, Transmission Control Protocol/Internet Protocol (TCP/IP), Secure Sockets Layer/Transport Layer Security (SSL/TLS), HTTP Secure (HTTPS), Internet Protocol Secure (IPSEC), and access to client certificates for use with security protocols.

8. A duplex transport system for use with a client computer system having a client application controlling a utility application, the client computer system communicatively linked to a network system and a server computer system having a server application; the server computer system communicatively linked to the network system, the duplex transport system comprising:

a client component configured to run as an instance on the client computer system, the instance of the client component being communicatively linked to one of the utility applications;

a server component configured to run as an instance on the server computer system, the instance of the server component being communicatively linked to one of the server applications; and

the client component and the server component configured such that the instance of the client component is associated with the instance of the server component in an association to form a session, the session having a session identifier and a sub-session designated as a data pipe, the data pipe having a pipe identifier and configured to provide two independent data paths

Sub A 7  
of duplex data traffic between the utility application communicatively linked to the instance of the client component and the server application communicatively linked to the instance of the server component.

9. The duplex transport system of claim 8 wherein the client computer and the server component are further configured such that the duplex data traffic of the data pipe of the session formed from the association between the instance of the client component and the instance of the server component utilizes Hypertext Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS), Internet Protocol Secure (IPSEC), Secure Sockets Layer/Transport Layer Security (SSL/TLS), other request-response protocols, and/or the same and/or other protocols approved by communication standards organizations including but not limited to such standards organizations as the International Telecommunications Union (ITU) including such committees as the Telecommunications, and the Telecommunications Standards Sector committee, and the Internet Architecture Board including such task forces as the Internet Engineering Task Force and the Internet Research Task Force.

10. The duplex transport system of claim 8 wherein the client computer and the server component are further configured such that the data pipe of the session formed from the association between the instance of the client component and the instance of the server component provides the data paths of duplex data traffic comprising messages that each contain the pipe identifier.

11. The duplex transport system of claim 8 wherein the client computer and the server component are further configured such that the data pipe of the session formed from the association between the instance of the client component and the instance of the server component data pipe is configured to provide data paths of duplex data traffic comprising messages that each contain the pipe identifier identifying the data pipe and a pipe sequence

Sub A 7  
number, the pipe sequence number identifying an order of the messages in the duplex data traffic associated with the data pipe.

12. The duplex transport system of claim 8 wherein the client computer and the server component are further configured such that the session formed from the association between the instance of the client component and the instance of the server component further comprises a second data pipe being a second sub-session of the session, the second data pipe having a pipe identifier, configured to provide two additional independent data paths of a second duplex data traffic between the utility application and the server application, and being a secondary data pipe.

13. The duplex transport system of claim 8 wherein the client component is configured to run with a browser program.

14. The duplex transport system of claim 8 wherein the client component and the server component are further configured to run as second instances where the second instances of the client component and server component are associated in an association to form a second session having a session identifier.

15. A client computer system for use with a duplex transport system and a server computer system having a server application, the client computer system and the server computer system having a server component communicatively linked to a network system, the client computer system comprising:

a client computer;

a browser program configured to run on the client computer, the browser program having built-in features associated with communication protocols used by the duplex transport system;

one or more browser applications configured to run on the client computer under control of the browser program;



sub A<sup>1</sup> 7

18. The client computer system of claim 15 wherein the client component is further configured to form an association between the instance of the client component and an instance of the server component to form a session having one or more data pipes that utilize the communication protocols associated with the built-in features of the browser program for duplex data traffic.

19. The client computer system of claim 15 wherein the built-in features of the browser program involve one or more of the following: uniform resource locators (URLs), firewall/proxy navigation under Hypertext Transfer Protocol (HTTP), proxy configuration of the browser program, HTTP authentication, Transmission Control Protocol/Internet Protocol (TCP/IP), Secure Sockets Layer/Transport Layer Security (SSL/TLS), HTTP Secure (HTTPS), Internet Protocol Secure (IPSEC), and access to client certificates for use with security protocols.

20. A server computer system for use with a duplex transport system and a client computer system, the client computer system having a client component and a browser application and the server computer system communicatively linked to a network system, the server computer system comprising:

a server computer;

one or more server applications configured to run on the server computer;

a server component configured to run as one or more instances on the server computer, each instance of the server component being communicatively linked to one of the server applications, each instance of the server component configured to be associated with an instance of the client component to form a session with a session identifier, the server component further configured to be associated with one or more data pipes, each data pipe being a sub-session of the session, each data pipe having a pipe identifier, each data pipe configured to provide two independent data paths of duplex data traffic between the browser application communicatively linked to the instance of the client component associated with the session of the

Sub A 7

data pipe and the server application communicatively linked to the instance of the server component associated with the session of the data pipe.

21. The server computer system of claim 20 wherein some of the built-in features of the browser program are associated with either Hypertext Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS), Internet Protocol Secure (IPSEC), Secure Sockets Layer/Transport Layer Security (SSL/TLS), other request-response protocols, and/or the same and/or other protocols approved by communication standards organizations . including but not limited to such standards organizations as the International Telecommunications Union (ITU) including such committees as the Telecommunications, and the Telecommunications Standards Sector committee, and the Internet Architecture Board including such task forces as the Internet Engineering Task Force and the Internet Research Task Force

22. The server computer system of claim 20 wherein the server component is further configured to be associated with the client component in an association to form a session that has more than one data pipes having duplex data traffic where each message of the duplex data traffic is assigned the pipe identifier corresponding to the data pipe used by each message.

23. The server computer system of claim 20 wherein the server component is further configured to be associated with the client component in an association to form a session that has one or more data pipes that utilize the communication protocols associated with the built-in features of the browser program for the duplex data traffic.

24. The server computer system of claim 20 wherein the built-in features of the browser program involve one or more of the following: uniform resource locators (URLs), firewall/proxy navigation under Hypertext Transfer Protocol (HTTP), proxy configuration of the browser program, HTTP authentication, Transmission Control Protocol/Internet Protocol (TCP/IP), Secure Sockets Layer/Transport Layer Security (SSL/TLS), HTTP Secure (HTTPS),



Sub A 7  
Internet Protocol Secure (IPSEC), and access to client certificates for use with security protocols.

25. A method for establishing duplex communication between a browser application running under control of a browser program on a client computer system and a server application running on a server computer system over a network, the method comprising:

registering a session listener callback function for the server application with a server component running on the server computer system;

initiating through the browser application creation of an instance of a client component to run on the client computer system;

establishing through the instance of the client component communication over the network with the server computer system;

based upon establishing communication between the client component and the server computer system, creating an instance of a server component to run on the server computer system;

notifying the server application through the session listener callback function of the establishment of the instance of the server component;

establishing an association between the instance of the client component and the instance of the server component as a session and assigning a session identifier to the session;

designating a sub-session of the session as a data pipe of duplex data traffic between the browser application and the server application; and

assigning a pipe identifier to the data pipe to be used by messages being sent through the data pipe.

26. The method of claim 25, further comprising:

registering a pipe listener callback function with the instance of the server component;

creating an instance of a second data pipe through the browser application from the instance of the client component and the instance of the server component; and

Sub A' 7

notifying the server application through the pipe listener callback function of creation of the second data pipe.

27. A method of transmitting data from a client computer system to a server computer system, the method comprising:

invoking a Read function through a server application on the server computer system, the server application associated with a session between an instance of a client component running on the client computer system and an instance of a server component running on the server computer system;

presenting a data buffer of the server application to an upstream component of a data pipe associated with the instance of the server component;

writing data from a browser application on the client computer system to an upstream component of a data pipe associated with the instance of the client component;

sending an Hypertext Transfer Protocol (HTTP) Post along with data to the instance of the server component, and

sending from the instance of the server component either a Server Read Return or a Server Receive callback along with the data to the server application.

28. The method of claim 27, further comprising:

sending an HTTP Post Reply to the instance of the client component; and

sending a Browser Write Return to the browser application.

29. A method of transmitting data from a server computer system to a client computer system, the method comprising:

invoking a Browser Read function through a browser application on the client computer system, the browser application associated with a session between an instance of a client component running on the client computer system and an instance of a server component running on the server computer system;

Sub A' 7

presenting a data buffer of the browser application to a downstream component of a data pipe associated with the instance of the client component;

writing data from a server application to a downstream component of a data pipe associated with the instance of the server component;

sending an Hypertext Transport Protocol (HTTP) Get Request from the instance of the client component to the instance of the server component;

if no data is available from the instance of the server component in a predetermined amount of time, sending an HTTP Get Reply with no data from the instance of the server component to the instance of the client component;

if a server application associated with the session sends data to the instance of the server component before or within a predetermined time after the HTTP Get Request is sent from the instance of the client component to the instance of the server component, then sending an HTTP Get Reply with data from the instance of the server component to the instance of the client component;

sending a Server Write Return from the instance of the server component to the server application to return control to the server application; and

sending a Browser Read Return from the instance of the client component to the browser application to return control to the browser application along with sending the data from the instance of the client component to the browser application.

30. The method of claim 29 wherein the invoking the Browser Read and sending the Browser Read Return is replaced by sending a Browser Receive from the instance of the client component to the browser application.